Journal of Pharmacopuncture

ISSN 2093-6966 [Print], ISSN 2234-6856 [Online]
Journal of Pharmacopuncture 2019;22[4]:231-238
DOI: https://doi.org/10.3831/KPI.2019.22.031

Original article

# An In *Vitro* and In *Vivo* Cholinesterase Inhibitory Activity of *Pistacia khinjuk* and *Allium sativum* Essential Oils

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**Key Words**

alzheimer disease, cholinesterase inhibitor, phenols, wistar rats

## Abstract

**Objectives:** Alzheimer's disease (AD), an overwhelming neurodegenerative disease, has deleterious effects on the brain that consequently causes memory loss and language impairment. This study was intended to investigate the neuroprotective activity of the two essential oils (EOs) from Iranian *Pistacia khinjuk* (PK) leaves and Allium sativum (AS) cloves against β-Amyloid 25–35 (Aβ25-35) induced elevation of cholinesterase enzymes in AD.

**Methods:** The EOs of PK (PKEO) and AS (ASEO) were prepared and analyzed in terms of extraction yield, phenolic content, and cholinergic markers in vitro. Moreover, both were administered orally to adult male Wistar rats at concentrations of 1, 2, and 3%. The inhibitory potential of PKEO and ASEO was compared with Donepezil (0.75 mg/kg) against the high activities of acetylcholinesterase (AChE) and butyrylcholinesterase (BChE) enzymes.

**Results:** PKEO reached an inhibition rate of 83.6% and 81.4% against AChE and BChE, respectively. ASEO had lower anti-cholinesterase activity (65.4% and 31.5% for the inhibition AChE and BChE). PKEO was found to have more phenolic content than ASEO. A significantly positive correlation was observed between the total phenolics and anti-cholinesterase potential. In rats, both EOs decreased the enzyme activity in a concentration-dependent manner. As compared with Donepezil, the significant difference in the AChE and BChE inhibition occurred as rats were treated with PKEO 3% ($p < 0.05$).

**Conclusion:** It could be concluded that PKEO and ASEO are potent inhibitors of AChE and BChE in rats that hold promise to be used for the treatment of AD.

**Received:** Mar 14, 2019 **Reviewed:** Jun 12, 2019 **Accepted:** Nov 26, 2019

## 1.Introduction

Alzheimer's disease (AD), a chronic and progressive degenerative disease, is considered as one of the most common causes of dementia in elderly [1]. Bartus et al. suggested that the cholinergic dysfunction in the brain of healthy elderly and dementia people can cause the memory loss and subsequent cognitive damage, thus, the repair of cholinergic activity probably decreases the serious lack of cognitive function [2]. Acetylcholine (ACh) is a critical neurotransmitter used by cholinergic neurons in main physiological processes, including attention, learning, memory, and so forth [3]. The presence of impairment to the cholin-



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